Effects of Singulation on Plant Population and Yield Potential of Corn

Background
For optimum yield potential to be realized, an optimum at-harvest plant population should be achieved. Harvest population depends on the corn product planted, seeding rate, the planter’s capability to deliver the target population, and soil and weather conditions during the growing season.

Singulation is a planter performance characteristic that ensures that only a single seed is picked up and fed to the planter, enabling precise timing and delivery of seeds to the soil. The ultimate goal is to reduce inter-plant competition and help achieve the corn product’s optimum yield potential.

Planters should be well equipped, adjusted, and monitored during operation to ensure that the highest possible singulation is achieved. Plant-to-plant placement variability within the row usually consists of some combination of crowded plants (doubles, triples, misplaced or worse) and long gaps (skips).

Always refer to the manufacturer’s manual and any added aftermarket equipment manuals before performing any maintenance.

The following have been identified as the biggest planter problems robbing corn fields of their potential yields:

- Skips are said to be highly detrimental to yield.
- Doubles can be slightly positive to yield.
- Misplaced plants have no effect on yield until plants are displaced from their preferred location by more than ½ the normal plant-to-plant distance.

This simulated study was designed to test and determine results for planting corn with skips, doubles, and optimal singulation and observing the respective effects on potential yields.

Study Guidelines
- A 112 RM corn product was planted on April 30, 2015.
- Corn was planted following soybeans with conventional tillage consisting of chisel plow in the fall followed by a soil finisher in the spring.
- Skips were simulated by plugging seed plate holes with glue (Figure 1).
- Seed plates were plugged to see results of targeted skips at 6, 4, 2 and 0%.
- Doubles were achieved by drilling extra holes adjacent to the seed plate holes (Figure 1) to see results of targeted doubles at 6, 4, 2 and 0%.
- A standard weed management program consisting of pre-emergence and post-emergence herbicides was used.
- A John Deere planter equipped with Precision Planting® 20/20 SeedSense® and vSet® meters was used.
- The trial was planted on 30-inch row spacing with six rows/treatment in 200 feet long strips with three replications (Figures 2-5).
- The target plant population at 100% singulation (0% skips and doubles) was 35,000 seeds/acre.
- Plots were harvested on October 5, 2015 and yield was adjusted to 15% moisture content.

Figure 1. Flat disk seed plates with holes plugged to simulate skips or extra holes drilled in to simulate doubles. Yellow arrows point to plugged or drilled holes.
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Figure 2 (above). Screen shot of FieldView® skip map indicating the targeted singulation treatments and field layout. Note the intensity of red dots indicating the level of singulation.

Figure 3 (left). Screen shot of the actual planted singulation report. The Hybrid column indicates the targeted singulation treatment.
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Figure 4 (above). Screen shot of FieldView® doubles map indicating the targeted singulation treatments and field layout. Note the intensity of blue dots indicating the level of singulation.

Figure 5. Screen shot of the actual planted singulation report. The Hybrid column indicates the targeted singulation treatment.
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Results and Discussion

The attempted singulation simulation was successful in both skips and doubles.

The targeted singulation was very close to the actual planted singulation (Figures 2-5). In this trial, yield increased as singulation increased (Figures 6 and 7).

The regression equation shows that skips (Figure 6) had a higher impact on yield than doubles (Figure 7). Yield decreased by about 4 bu/acre for every percent loss in singulation due to skips and about 1.5 bu/acre loss for every percent loss in singulation due to doubles.

Figure 6. Effects of planter skips on plant population and yield. The regression equation represents yield.

Figure 7. Effects of planter doubles on plant population and yield. The regression equation represents yield.
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This result is consistent with several research trials that concluded the planting outcome causing the greatest yield loss is % skips. While it may be true that a plant adjacent to a skip may be able to compensate and produce larger ears, this is only a partial compensation for the missing plant.

As expected, ears from the skips trial (Figure 8A) were much larger than the doubles trials ears and the correctly spaced ears (Figure 8B). Even with the near optimum growing conditions experienced in 2015, corn plants still responded positively to reduced inter-plant competition.

In ideal growing conditions, yield potential may respond positively to increased population, so that doubles could actually boost yields. Although this can be true in ideal conditions, it is imperative not to confuse doubles with increased plant population. Specific seeding rates place seeds at regular intervals from each other, and doubles defy this spacing regularity. With doubles, the inter-plant competition is more severe than in other parts of the field. The time of emergence of the two plants is of particular importance with doubles. If both plants emerge at the same time as the rest of the plants in the row, then they could contribute significantly to the overall field yields as shown in Figure 8B. If, on the other hand, one or both are late emergers (Figure 8C), then the yield penalty could be great. In some situations, such late emergers may not produce an ear.

Takeaways

- This trial attempted to separate and predict the potential yield losses due to skips and doubles.
- It should be noted; however, that these two planting defects are not necessarily mutually exclusive in growers’ fields.
- A skip could very well be followed by a double.
- Thus, yield losses could be additive.
- Every effort should be taken to achieve the highest possible singulation.
- The effect of skips on yield potential is similar to that observed in 2014 at the same research location; however, doubles had a much larger effect on yield in that trial.
- While singulation affects spacing (predetermined distance between plants as specified by the targeted seeding rate), it is worth noting that not all plant spacing defects are caused by the planter.
- Soil, weather, and seed conditions during and after planting are important factors that also need to be considered to attain the desired perfect picket fence corn stand.

Sources

2 Demonstration Report. 2015. Precision Planting singulation trial. Monsanto Learning Center at Huxley, IA. 040615JMG.

Legals

The information discussed in this report is from a single site, replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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Figure 8. Corn fields showing the effects of planter skips (A) and doubles (B and C) on ear size and yield.